

ISHIO et al.
Serial No. 09/883,366
Response to Office Action dated October 20, 2004

Remarks

Reconsideration and allowance of the subject patent application are respectfully requested.

Claims 1-3, 6-10, 17, 18, 22-29, 31, 33 and 35 were rejected under 35 U.S.C. Section 102(b) as allegedly being "anticipated" by Maitani *et al.* (U.S. Patent No. 6,656,828). Claim 1 has been amended to incorporate the subject matter of now-canceled claim 4 that the metal layer includes a nickel layer and a gold layer. Claim 17 has been amended to incorporate the subject matter of now-canceled claim 20 that the metal layer in the opening comprises a barrier metal layer and a top layer. Claim 25 has been amended to incorporate the feature of claim 34 that the metal layer in the opening comprises a barrier metal layer and a top layer. Each of the claims 17 and 25 further specifies that the barrier metal layer is formed only in the opening in the insulating layer. Claim 35 has been amended to describe that the metal layer having its lateral dimensions defined by the opening in the insulating layer comprises a barrier metal layer and a top layer. Conforming amendments have been made to claims 5, 26, 31, 32, 33 and 34 and claims 2, 3, 8, 9, 27, 29 and 30 have been canceled without prejudice or disclaimer.

Based on these amendments, the rejection based on Maitani *et al.* is believed to be moot. In addition, because these amendments add to the independent claims subject matter already present in dependent claims, no new issues are believed to be raised. As such entry of the amendments is believed to be appropriate and is respectfully requested.

Brouillette *et al.* is alleged to remedy the deficiencies of Maitani *et al.* in connection with claims 4, 20 and 34. More specifically, the office action acknowledges that Maitani *et al.* does not disclose the subject matter incorporated into the independent claims regarding the features of the metal layer. However, Brouillette *et al.* is alleged to show Au-Ni formation in the opening of an insulating layer by electroplating. The office action contends that it would have been obvious to incorporate the teachings of Brouillette *et al.* into Maitani *et al.* in order to enhance the reliability in connection between the conductive layer and the bump electrode.

Applicants traverse these assertions because, for example, the Figure 5 embodiment of Maitani *et al.* referenced in the office action already provides a barrier layer 14 of Ni over the Cu

ISHIO et al.

Serial No. 09/883,366

Response to Office Action dated October 20, 2004

interconnection 6. Thus, Applicants respectfully submit that there would have been no motivation or suggestion to incorporate the Ni-Au arrangement of Brouillette *et al.* into Maitani *et al.*, the result of which would be an arrangement including two barrier metal layers which, in the proposed combination, would be of the same material. As Applicant understands the combination proposed in the office action, the Ni layer of Brouillette *et al.* would be formed on the Ni layer of Maitani *et al.* This would result in an increased Ni thickness at portions exposed in the openings than at other places. Among other things, it is not seen by Applicants how such an arrangement would "enhance the reliability in connection between the conductive layer and the bump electrode", which is the motivation stated in the office action for making the proposed combination. Absent hindsight, Applicants submit that a combination of Maitani *et al.* and Brouillette *et al.* would have never resulted in providing a barrier metal layer such as Ni other than the barrier metal layer 14 of Ni formed on Cu layer 6 in Maitani *et al.*

For at least these reasons, Applicants respectfully submit that the proposed combination of Maitani *et al.* and Brouillette *et al.* would not have rendered obvious the subject matter of the independent claims or the claims that depend therefrom.

Claim 19 was rejected under 35 U.S.C. Section 103(a) as allegedly being "obvious" over Maitani *et al.* in view of Greer (U.S. Patent No. 6,451,681). However, as previously discussed, this purported "conductive layer" of Greer is, among other things, not connected to an electrode pad formed on a semiconductor substrate as claimed. As such, Greer would not have provided any teaching or suggestion to modify the conductive layer of Maitani *et al.* as proposed.

Applicants submit that the pending claims are in condition for allowance, and action to that end is earnestly solicited.

ISHIO et al.

Serial No. 09/883,366

Response to Office Action dated October 20, 2004

If any issues remain to be resolved, the Examiner is urged to contact the attorney for Applicants at the telephone number listed below.

Respectfully submitted,

NIXON & VANDERHYE P.C.



Michael J. Shea

Registration No. 34,725

1100 North Glebe Road, 8th Fl.
Arlington, Virginia 22201
Telephone: (703) 816-4000
Facsimile: (703) 816-4100
MJS:mjs